EngineeringRise

Semiconductors, p-n junction diode and rectifier

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Mass action	n p = n_i^2 Valid when: thermal equilibrium, intrinsic or doped semiconductor	per cubic metre squared
Forward drop (constant-drop model)	Si 0.7 V, Ge 0.3 V Valid when: diode conducting in forward bias, constant-drop model	V
Dynamic resistance	r = dV/dI Valid when: small change about an operating point on the forward curve	ohm
Half-wave average and rms	V_dc = V_peak/pi; V_rms = V_peak/2 Valid when: ideal diode, sinusoidal input, resistive load	V
Full-wave average and rms	V_dc = 2 V_peak/pi; V_rms = V_peak/sqrt(2) Valid when: ideal full-wave rectifier, sinusoidal input, resistive load	V
Ripple frequency	half wave f; full wave 2f Valid when: f is the ac input frequency	Hz
Peak from rms	V_peak = sqrt(2) V_rms Valid when: sinusoidal ac only	V
Bridge with silicon diodes	V_out(peak) = V_peak - 1.4 V Valid when: bridge rectifier, two diodes conduct, 0.7 V each	V
Conduction angle (threshold V_d)	180 degrees - 2 asin(V_d/V_peak) Valid when: sinusoidal input, diode with constant drop V_d below V_peak	degrees

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/electronic-devices/semiconductors-p-n-junction-diode-and-rectifier

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